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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/502,466	07/07/2005	Michael L. Roukes	049411-0234	3971

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EXAMINER	
BARBEE, MANUEL L	

ART UNIT	PAPER NUMBER
2857	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/502,466	ROUKES ET AL.	
	Examiner	Art Unit	
	Manuel L. Barbee	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-8,14-18,20-22,24-28,34-38 and 40* is/are rejected.

7)☒ Claim(s) *3,9-13,19,23,29-33 and 39* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 July 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

On page 2 of the specification the acronyms "NEMS" and "AFM" should be defined.

Appropriate correction is required.

Claim Objections

2. Claims 9-13 and 29-33 are objected to because of the following informalities:

On line 5 of claim 9, limitations for "the mixed output" lack antecedent basis. Claim 29 contains similar limitations. While this may refer to the chopping output, the claim should be amended to clearly show what output is being filtered.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 4, 14, 15, 20, 21, 24, 34, 35 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over anticipated by US Patent Application Publication 2003/0137216 to Tamayo de Miguel et al. (Miguel) in view of US Patent No. 2003/0043925 to Stopler et al. (Stopler).

With regard to generating the output signal from the oscillation of a transducer and detecting whether the signal represents a predetermined type of interaction between a free ligand in a fluid and a receptor attached to the transducer, as shown in claims 1 and 21, Miguel teaches a chemical and biosensors that detect the interation between a ligand and a receptor (par. 7).

Miguel does not teach mixing the output, filtering the mixed output, detecting the mixer output and determining whether the signal satisfies a threshold, as shown in claims 1 and 21. With regard to mixing an output signal with a reference and filtering the mixed output, as shown in claims 1 and 21, Stopler teaches mixing an output and filtering the mixed output (Fig. 2, elements 66 and 68; pars. 78, 81). With regard to detecting the correlator output and determining whether the detected output satisfies a predetermined threshold, as shown in claims 1 and 21, Stopler teaches detecting an output and using a threshold (Fig. 2, decoder 100; Fig. 3, threshold 50). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the sensor, as taught by Miguel to include signal processing, as taught by Stopler, because then the sensor output would have been detected accurately (Miguel, par. 15; Stopler, pars. 12, 13).

With regard to deciding whether the ligand is bound to the receptor, as shown in claims 4 and 24, Miguel teaches detecting interaction between a ligand and a receptor (par. 7).

With regard to providing a NEMS transducer with an attached bioreceptor, as shown in claims 14 and 34, Miguel teaches a sensor with a receptor (pars. 7, 64). With

regard to exposing the biofunctionalized transducer to a free ligand in a fluid, as shown in claims 14 and 34, Miguel teaches exposing the sensor to a ligand in a fluid environment (pars. 65, 66). With regard to interacting the free ligand with the bio receptor to provide an interaction and oscillating the transducer to detect the existence of the interaction, as shown in claims 14 and 34, Miguel teaches oscillations of the transducer to detect the interaction of a ligand and a receptor (pars. 7, 64, 64; Figs. 4, 5).

With regard to a oscillating a piezoresisitive transducer by means of thermal fluctuations, as shown in claims 15 and 35, and oscillating with a driving signal, as shown in claims 16 and 36, Miguel teaches a piezoelectric device (par. 64).

With regard to providing a substrate and ligand coupling the transducer to the substrate, Miguel teaches detecting interactions between a ligand and a receptor (par. 7).

5. Claims 2 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miguel in view of Stopler as applied to claims 1 and 21 above, and further in view of US Patent Application Publication 2003/0138875 to Powers et al. (Power).

Miguel and Stopler teach all the limitations of claim 1 upon which claim 2 depends and claim 21 upon which claim 22 depends. Miguel and Stopler do not teach applying the Neyman-Pearson criterion, as shown in claims 2 and 22. Powers teaches using the Neyman-Pearson test in detection (par. 47). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the sensor combination, as taught by Miguel and Stopler, to include using the Neyman-Pearson

test, as taught by Powers, because false detections would have been reduced (Powers, par. 47).

6. Claims 5 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miguel in view of Stopler as applied to claims 1 and 21 above, and further in view of US Patent No. 5,814,468 to Siiman et al. (Siiman).

Miguel and Stopler teach all the limitations of claim 1 upon which claim 5 depends and claim 21 upon which claim 25 depends. Miguel and Stopler do not teach deciding whether a bound ligand has been released by competitive binding with the free ligand, as shown in claims 5 and 25. Siiman teaches analyzing competitive binding to analyze for receptors that have been released (col. 2, line 22 - col. 3, line 5). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the sensor combination, as taught by Miguel and Stopler, to include analyzing for released receptors, as taught by Siiman, because then releasing reactions would have been detected.

7. Claims 6, 8, 26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miguel in view of Stopler as applied to claims 1 and 21 above, and further in view of US Patent No. 5,444,736 to Kawashima et al. (Kawashima).

Miguel and Stopler teach all the limitations of claim 1 upon which claims 6 and 8 depend and claim 21 upon which claims 26 and 28 depend. Miguel and Stopler do not teach squaring the mixer output, as shown in claims 6 and 26, or summing the correlator output samples as shown in claims 8 and 28. Kawashima teaches squaring and summing the detected signals (col. 8, lines 29-28). It would have been obvious to

one of ordinary skill in the art at the time the invention was made to modify the sensor combination, as taught by Miguel and Stopler, to include squaring and summing the signals, because then the signal would have been stabilized (Kawashima, col. 2, lines 6-26).

8. Claims 7 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miguel and Stopler as applied to claims 1 and 21 above, and further in view of US Patent No. 3,900,876 to Tsukada et al. (Tsukada).

Miguel and Stopler teach all the limitations of claim 1 upon which claim 7 depends and claim 21 upon which claim 27 depends. Miguel and Stopler do not teach detecting the envelope of a signal, as shown in claims 7 and 27. Tsukada teaches using envelope detection (col. 2, lines 35-40). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the sensor combination, as taught by Miguel and Stopler, to include envelope detection, because then a well known method of detection would have been used.

9. Claims 17, 18, 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miguel and Stopler as applied to claims 1 and 21 above, and further in view of US Patent No. 4,695,817 to Kurtz et al. (Kurtz).

Miguel and Stopler teach all the limitations of claim 1 upon which claims 17 and 18 depend and claim 21 upon which claims 37 and 38 depend. Miguel and Stopler do not teach coupling a first and second transducer with fluid, as shown in claims 17, 18, 37 and 38. Kurtz teaches coupling two transducers with fluid (claim 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to

modify the sensor combination, as taught by Miguel and Stopler to include two transducers coupled with fluid, as taught by Kurtz, because then pressure would have been measured (Kurtz, col. 1, lines 8-14).

Allowable Subject Matter

10. Claims 3, 19, 23 and 39 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. Claims 9-13 and 29-33 would be allowable if rewritten or amended to overcome the objection for minor informalities, set forth in this Office action.

12. The following is a statement of reasons for the indication of allowable subject matter: The primary reason for indicating allowable subject matter in claims 9-13 and 29-33 is the inclusion of limitations for multiplying the summed and differenced quadrature components generated from the output of the oscillation of a transducer, integrating the multiplied signal and summing multiple measurements of the multiplied signal.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Manuel L. Barbee whose telephone number is 571-272-2212. The examiner can normally be reached on Monday-Friday from 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eliseo Ramos-Feliciano can be reached on 571-272-7925. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Manuel L. Barbee
Examiner
Art Unit 2857

mlb
June 11, 2007